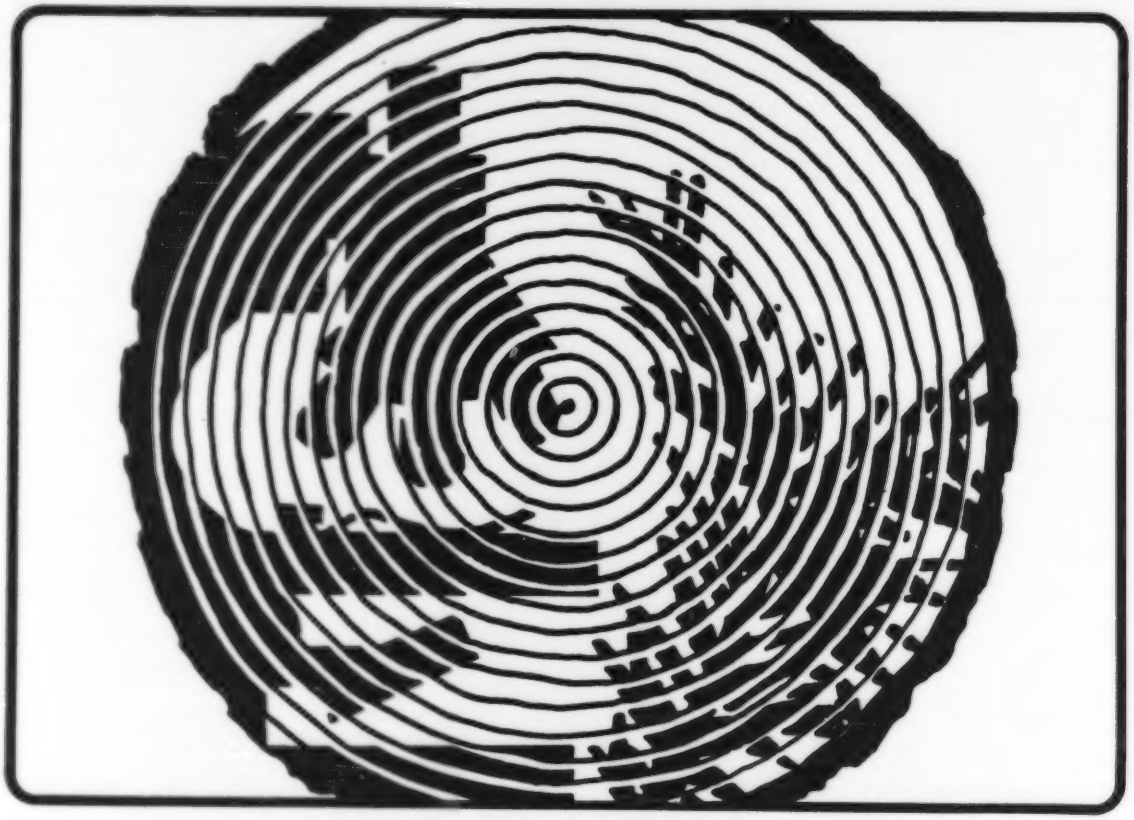
Forest Development

Research Trust Fund

Annual Report 1986-87



Alberta

FORESTRY LANDS AND WILDLIFE

Forest Service

FOREST DEVELOPMENT RESEARCH TRUST FUND

ANNUAL REPORT

1986/87

EDMONTON

Alberta
FORESTRY,
LANDS AND WILDLIFE
Forest Service

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Information Centre
Alberta Energy/Forestry, Lands and Wildlife
Main Floor, Bramalea Building
9920 - 108 Street
Edmonton, Alberta, Canada T5K 2M4
Telephone: (403) 427-3590

Alberta Forestry, Lands and Wildlife
Alberta Forest Service
Forest Research Branch
215 McLeod Avenue, Boville Building
Spruce Grove, Alberta T7X 2Y4
Telephone: (403) 962-8700

Alberta
FORESTRY, LANDS AND WILDLIFE

File No.

Forest Research Branch, 215 McLeod Avenue, Postal Bag 6343, Spruce Grove, Alberta, Canada T7X 2Y4 403/962-8700

The Honourable LeRoy Fjordbotten
Minister of Forestry, Lands and Wildlife
403 Legislature Building
Edmonton, Alberta
T5K 2B7

Sir:

I have the honor to submit the Annual Report of the Forest Development Research Trust Fund for the fiscal year ending March 31, 1987.

Respectfully submitted,

S. Navratil, Chairman
Advisory Council
Forest Development Research
Trust Fund

FOREWORD

In the 1986-87 fiscal year five new and five renewed studies were funded by the Forest Development Research Trust Fund. These studies investigated the problems and research needs related to pest management of mountain pine beetle, growth and volume models of commercial tree species, use of mycorrhizae technology in reforestation, drainage of peatland, silviculture of cutovers, micropropagation and tissue culture of lodgepole pine, erosion hazard rating and susceptibility to Armillaria root rot.

Two projects were completed. Dr. Hiratsuka's research on Armillaria root rot described the biological species of Armillaria occurring in Alberta and their relative capability of causing mortality to forest tree seedlings. It also developed a method for detecting Armillaria fungus in the soil.

The study "Critical resources of Wapiti in the Boreal foothills region of Alberta" by Dr. R.J. Hudson, University of Alberta, evaluated the importance of lichen biomass for restoration of woodland and mountain caribou populations.

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FOREST RESEARCH ADVISORY COUNCIL

CHAIRMAN

Dr. S. Navratil (Stan)

MEMBERS

C.B. Smith (Cliff)
Assistant Deputy Minister
Alberta Forest Service
Forestry, Lands & Wildlife
10th Floor, South Tower
Petroleum Plaza
9915 - 108 Street
Edmonton, Alberta

Dr. T.J. Drew, Director (John)
Reforestation and Reclamation Branch
Forestry, Lands and Wildlife
9th floor, Bramalea Building
9920 - 108 Street
Edmonton, Alberta

Mr. C.A. Dermott (Con)
Director, Timber Management Branch
Forestry, Lands & Wildlife
9th floor, Bramalea Building
9920 - 108 Street
Edmonton, Alberta

Dr. R. Fessenden, Head (Robert)
Terrain Sciences
Alberta Research Council
250 Karl Clark Road
Box 8330, Station F
Edmonton, Alberta
T6H 5Y2

Mr. Roy Brassard, MLA
513 Legislative Buidling
Edmonton, Alberta
(Olds Didsbury)

Mr. A.D. Kiil, (Dave)
Director General
Northern Forestry Centre
5320 - 122 Street
Edmonton, Alberta
T6H 5R7

Dr. J.A. Beck, Chairman
Department of Forest Science
Faculty of Agriculture
and Forestry
University of Alberta
Edmonton, Alberta
T6G 2G6

Mr. P. Wearmouth
Staff Forestry Manager
Procter and Gamble
Cellulose Ltd.
Bag 1020
Grande Prairie, Alberta
T8V 3A9

Mr. A. Rytz (Arden)
General Manager
Alberta Forest Products Assoc.
#204, 11710 Kingsway Avenue
Edmonton, Alberta
T5G 0X5

Dr. H.P. Sims (Percy)
Director
Research Management
Alberta Environment
Standard Life Plaza
10405 - Jasper Avenue
Edmonton, Alberta
T5J 3N4

Mr. M.C. Summers (Murray)
Woodlands Manager
Blue Ridge Lumber (1981) Ltd.
Box 1079
Whitecourt, Alberta
T0E 2L0

Mr. D. Laishley
Chief Forester
Champion Forest Products
(Alberta) Ltd.
Postal Bag 8000
Hinton, Alberta
T0E 1B0

COMPLETED PROJECTS

PATHOLOGICAL AND PHYTOCHEMICAL STUDIES OF ARMILLARIA ROOT ROT OF INTENSIVELY MANAGED YOUNG CONIFERS FORESTS IN ALBERTA

INVESTIGATOR: Dr. Y. Hiratsuka

CRITICAL RESOURCES OF WAPITI IN THE BOREAL FOOTHILLS REGION OF ALBERTA

INVESTIGATORS: Dr. R.J. Hudson
C.D. Olsen

NEW PROJECTS

SEED FROM SPRUCE RESIDUALS ON CUTOVERS IN CENTRAL ALBERTA

INVESTIGATOR: Dr. A. K. Hellum, University of Alberta

DURATION: One year

OBJECTIVES: To make comparisons of seed and seedlings from (logging) residuals and from the uncut adjacent stands; to sample at random 3 cutblock locations; to collect seeds from 40 trees at each site, 20 from the adjacent stand and 20 from the cutover; and, to make comparisons of germination, early growth, survival and possible genetic differences.

PROGRESS: To answer a concern that unmerchantable residual trees left to grow after harvesting may be stocking cutblocks with inferior seedlings, seed from residual trees in two cutblocks in the Peace River Forest were collected. This seed and the resultant seedlings were compared to those from seed collected from dominant and codominant trees in adjacent stands. The seed collected from the residual trees was significantly smaller than the seed collected from the adjacent trees in the leave strips. The seedlings produced from the residual seeds were also significantly smaller at first. However, the differences between the seedlings from the residual and leave trees markedly decreased by the time they were 12 weeks old. It can be concluded, with some caution reserved for possible geographic variation, that the seedlings from residual spruce are very similar to seedlings produced from residual dominant and codominant trees in the leave strips.

FUTURE WORK: A final report has been received.

CULTURAL AND TAXONOMIC STUDIES OF ECTOMYCORRHIZAL FUNGI ASSOCIATED WITH *PINUS CONTORTA* AND *PICEA MARIANA* IN WEST CENTRAL ALBERTA

INVESTIGATORS: Dr. R. Currah, University of Alberta
Dr. L. Sigler, University of Alberta

DURATION: Three years (1986 - 1989)

OBJECTIVES: To acquire site-specific isolates of mycorrhizal associates of lodgepole pine and white and black spruce in forests of Alberta; to determine the cultural characters of mycorrhizal fungi collected; and to establish a western Canadian facility which will provide ultra low temperature storage conditions for basidiomycete strains important to basic and applied research in forestry.

PROGRESS: The project was revised after review by the Alberta Forest Service to include white spruce, and the Bow/Crow Forest was included. Funding for the ultra low temperature storage facility was not provided. A total of 382 herbarium specimens were prepared and are now being documented at the University of Alberta Microfungus Herbarium. Various types of culture media and growth promoting compounds are being tested. Growth, development and appearance are being evaluated on the various types of media.

FUTURE WORK: Additional collections will be made and further work on culture techniques will be conducted.

HISTOCHEMICAL ASPECTS OF TREE-ROOT-SOIL INTERACTIONS

INVESTIGATOR: Dr. W. B. McGill, University of Alberta

DURATION: Three years (1986 - 1989)

OBJECTIVES: To resolve structural and biochemical features of roots in the presence of fungal infections; and, to attempt to refine views of root-fungal-soil interactions in mycorrhizal associations of forest tree seedlings.

PROGRESS: Soil phosphorous has a marked effect on plant growth response to mycorrhizal fungi, yet the mechanism of these effects is poorly understood. This project was intended to clarify how these effects can be quantified so that prescriptions for difficult sites can be developed. Initial results with lodgepole pine inoculated with mycorrhizal fungi and with the addition of inorganic phosphorous resulted in height growth increase of 72%, stem dry weight increase of 93%, and root dry weight increase of 83%. Additional phosphorous had the greatest effect on stem dry weight at 100 mg/kg of soil, while root dry weight showed the greatest response at a level of 50 mg/kg.

FUTURE WORK: The test of soil phosphorous effects on plant performance and ergosterol and chitin levels will be carried out with a larger seedling population base to apply proper statistical analyses. Chitin synthase assays are to be applied to mycelia and mycorrhizal roots to provide insight into enzymological responses on roots and fungi in isolation and in mycorrhizal associations. This research will provide insights to seedling - root - soil fertility - mycorrhizae interactions.

EFFECT OF SOIL FACTORS ON ARMILLARIA ROOT ROT

INVESTIGATOR: Dr. Peter Blenis, University of Alberta

DURATION: One year

OBJECTIVE: To determine whether soil type and conditions effect the pathogenicity of Armillaria species.

PROGRESS: In greenhouse tests there was some evidence to support the hypothesis that lodgepole pine trees growing on different soil types found in the Edson Forest had different susceptibilities to Armillaria root rot. This implies a possibility for integrating soil factors and a hazard rating system for this disease. Tests were also done to see if white spruce were as susceptible to infection as lodgepole pine. The tests indicated that the white spruce was even more susceptible, so the lower infection rates in the field are evidently not due to any innate resistance.

FUTURE WORK: A report has been received.

PRODUCTION OF LODGEPOLE PINE PLANTLETS FROM SEED OF SELECTED TREES

INVESTIGATOR: Dr. Trevor Thorpe, University of Calgary

DURATION: One year

OBJECTIVES: To produce hardened plantlets from seed from each of six phenotypically selected trees of lodgepole pine (*Pinus contorta*)

PROGRESS: Efforts to produce hardened plantlets from the seeds by accepted tissue culture methods were unsuccessful. It is uncertain whether the lack of success was due to the immaturity of seeds at harvest or due to the adolescence of the trees from which the seeds were collected.

FUTURE WORK: The work should be repeated with fully ripened seed of mature trees.

RENEWED PROJECTS

PHEROMONE TECHNOLOGY IN FOREST PEST MANAGEMENT; SPRUCE BEETLE AND MOUNTAIN PINE BEETLE

INVESTIGATOR: Dr. H. Wieser, University of Calgary
Dr. E. Dixon, University of Calgary

DURATION: One year

OBJECTIVES: To improve the efficacy of pheromone formulations as a means of controlling, monitoring and manipulating bark beetle populations; and to develop strategies for pheromone deployment in forest pest management.

PROGRESS: Both mountain pine beetles and spruce bark beetles are serious pests in Alberta's forests. Pheromones can be used in traps and bait trees as a method of monitoring population levels and limiting the damage from epidemic outbreaks. In addition to the natural pheromones, several enaniomers, analogs and synergists were examined. Spruce beetle trapping trials in northern Alberta showed that alpha-pinene was the most effective monoterpene. A bark beetle (Hylurgops rugipennis) known to make secondary attacks on spruce trees was attracted in large numbers by the formulation containing seudenal and frontalin. In trapping trials of mountain pine beetle, none of the chemicals and sterioisomers tested in these experiments as substitutes for exo-brevicomin showed the same consistent efficacy. This work demonstrated the value of tree baiting for monitoring endemic populations, localizing potential trouble areas and reducing the hazard of population buildup. Evidence was also found that trapping, contrary to current views, is capable of confining beetles within the baited area and thus reducing total stand damage.

FUTURE WORK: A final report was submitted.

DEVELOPMENT OF A STEM AREA GROWTH FUNCTION

INVESTIGATOR: Dr. S. J. Titus, University of Alberta

DURATION: One year

OBJECTIVES: To determine estimates of individual tree volume for lodgepole pine and white spruce in Alberta; to relate coefficients of stem area growth model to stand characteristics and environmental variables; and to evaluate capability of existing taper, height growth and diameter growth models to evaluate stem area and volume growth.

PROGRESS: Stem analyses were conducted on lodgepole pine, white spruce and black spruce from mixed stands in west central Alberta in an effort to develop a model which would accurately predict volume growth and distribution over the tree. It was found that annual diameter increment changes with age at different rates depending on the height along the stem. The pattern of variation in diameter increment differed among the species examined and among crown classes within species. These variations were related to shade tolerance of the species in that the more intolerant lodgepole pine showed a quicker decline in growth rate after the early maximum at a given height than did the more tolerant spruces.

FUTURE WORK: A final report was submitted.

FREEZE/THAW CYCLES ON A DRAINED AND UNDRAINED BOREAL WETLAND SITE

INVESTIGATOR: Dr. R. Rothwell, University of Alberta

DURATION: Two years (1985 - 1987)

OBJECTIVES: To evaluate the effects of drainage on the freeze/thaw cycles and frost depth on a boreal wetland site; to determine if freeze/thaw cycles and frost depths are different between drained and undrained peatland areas, and if they vary with different ditch spacing; and, how does the timing of snow melt correspond to freeze/thaw cycles.

PROGRESS: Because the surface of the drained peat dries out and forms a layer of thermal insulation the temperatures below the surface were cooler in summer, and thawing of ground frost was delayed in the spring. Differences in the characteristics of the peat complicated the analysis regarding saturated conductivity and ditch spacing. Results of this study suggested that drainage under conditions of shallow peats of low hydraulic conductivity could lower substrate temperatures enough to induce the formation of localized permafrost.

FUTURE WORK: A MSc thesis has been submitted in lieu of the report.

HOST EFFECTS OF GENETICS AND BEHAVIOUR OF THE MOUNTAIN PINE BEETLE

INVESTIGATOR: Dr. J. R. Spence, University of Alberta

DURATION: Three years (1985 - 1988)

OBJECTIVES: To assess genetic variation and morphological differences among mountain pine beetle populations in relation to host use of lodgepole, limber and whitebark pines.

PROGRESS: Although mountain pine beetle populations are not epidemic at present, future outbreaks are probable. Control measures have been concentrated on populations found in lodgepole pine, but it is known that beetles also infest non-commercial stands of limber pine and whitebark pine. To evaluate the possibility that the endemic beetle populations in these non-commercial species could form a source for population buildup and future infection of lodgepole pine, beetles hosted by the three tree species were tested for their readiness to attack the other tree species.

It was found that the beetles from both limber and whitebark pines readily attacked lodgepole pine under laboratory conditions. Therefore, it was concluded that beetle populations in these non-commercial species will have to be considered in any effort to prevent a future epidemic outbreak in lodgepole pine.

FUTURE WORK: Morphological studies will be completed and the final written report submitted.

FIELD EVALUATION OF AN EROSION HAZARD ASSESSMENT SYSTEM IN WEST CENTRAL ALBERTA

INVESTIGATOR: Dr. R. Rothwell, University of Alberta

DURATION: Two years (1985 - 1987)

OBJECTIVES: To assess the validity of the erosion hazard system; to determine how effective the system is in identifying erosion hazard resulting from land use disturbances such as logging and road construction.

PROGRESS: Field evaluation of the theoretical erosion hazard rating system based on soil associations was done by two different methods. Both methods strongly indicated that predicting soil erosion hazard based on forest cover types and soil associations is not reliable enough for use in planning harvesting operations. Recommendation for improvement of the erosion hazard rating system has been made.

FUTURE WORK: Two MSc theses in lieu of the report have been submitted.

FOREST DEVELOPMENT RESEARCH TRUST FUND

FINANCIAL STATEMENTS

MARCH 31, 1987

Auditor's Report

Balance Sheet

Statement of Revenue, Expenditure and Unexpended Funds

Notes to the Financial Statements

ALBERTA LEGISLATURE

OFFICE OF THE AUDITOR GENERAL

AUDITOR'S REPORT

To the Council of the Forest Development
Research Trust Fund

I have examined the balance sheet of the Forest Development Research Trust Fund as at March 31, 1987 and the statement of revenue, expenditure and unexpended funds for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Fund as at March 31, 1987 and the results of its operations for the year then ended in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Donald D. Salmon
C.A.
Auditor General

Edmonton, Alberta
July 30, 1987

FOREST DEVELOPMENT RESEARCH TRUST FUND

BALANCE SHEET

AS AT MARCH 31, 1987

	1987	1986
ASSETS		
Current:		
Cash	$178,113	$178,225
LIABILITIES		
Current:		
Research grants payable	$ 48,144	$ 61,535
Accounts payable	690	575
Unexpended funds	129,279	116,115
	$178,113	$178,225

The accompanying notes are part of these financial statements.

FOREST DEVELOPMENT RESEARCH TRUST FUND

STATEMENT OF REVENUE, EXPENDITURE AND UNEXPENDED FUNDS

FOR THE YEAR ENDED MARCH 31, 1987

	1987	1986
REVENUE		
Contributions by the Province of Alberta (Note 3)	$100,000	$100,000
Interest	16,959	18,300
Donations	-	115
	116,959	118,415
EXPENDITURE		
Research grants	103,105	127,851
Council members' fees and expenses	690	575
	103,795	128,426
Excess of revenue over expenditure	13,164	(10,011)
Unexpended funds at beginning of year	116,115	126,126
Unexpended funds at end of year	$129,279	$116,115

FOREST DEVELOPMENT RESEARCH TRUST FUND

NOTES TO THE FINANCIAL STATEMENTS

MARCH 31, 1987

Note 1 Authority

The Forest Development Research Trust Fund operates under the authority of the Forest Development Research Trust Fund Act, Chapter F-13, Revised Statutes of Alberta 1980.

Note 2 Changes in Financial Position

A statement of changes in financial position is not provided as disclosure in these financial statements is considered to be adequate.

Note 3 Contributions by the Province of Alberta

The Department of Forestry, Lands and Wildlife provides contributions annually for research and council members' expenditure incurred by the Fund. Where expenditure is less than the contributions in any given year, the balance is repayable to the General Revenue Fund.

Note 4 Administration Expenses

Salaries, accommodation, and other administrative costs incurred in the administration of the Fund are borne by the General Revenue Fund and are not reflected in these financial statements.

Note 5 Commitments

As at March 31, 1987, the Fund had research grant commitments totalling $134,020 (1986 $112,235).

Note 6 Approval of Financial Statements

These financial statements were approved by management.